

LIST OF CLAIMS / AMENDMENTS

Claims 4, 14-25, 29, and 39-50 were previously withdrawn.

No claims are amended.

Claims 1-3, 5-13, 26-28, 30-38, and 51-60 are pending as follows:

1. **(previously presented)** A hybrid actuator for actuating a component, comprising:

a first actuator adapted to be coupled to the component and to move the component a first actuation distance;

a second actuator adapted to be coupled to the component and to move the component a second actuation distance; and

a linkage connected to the first actuator and connected to the second actuator, the linkage adapted to combine the first actuation distance and the second actuation distance and to move the component a third actuation distance.

2. **(original)** The hybrid actuator of Claim 1, wherein:  
the first actuator includes a hydraulic piston.

3. **(original)** The hybrid actuator of Claim 1, wherein:  
the second actuator includes a piezo-electric actuator.

4. **(withdrawn)** The hybrid actuator of Claim 3, wherein:  
the second actuator includes an x-frame actuator.

1  
2 5. (original) The hybrid actuator of Claim 3, wherein:

3 the second actuator includes a piezo-electric cylinder actuator.

4  
5 6. (original) The hybrid actuator of Claim 1, wherein:

6 the linkage includes a pushrod attached between the first actuator and the  
7 second actuator.

8  
9 7. (original) The hybrid actuator of Claim 1, wherein:

10 the linkage includes a mount attached to the second actuator adapted to  
11 hold the first actuator and move the first actuator the second actuation distance.

12  
13 8. (original) The hybrid actuator of Claim 1, wherein:

14 the third actuation distance includes at least one of adding the second  
15 actuation distance to the first actuation distance and subtracting the second  
16 actuation distance from the first actuation distance.

17  
18 9. (original) The hybrid actuator of Claim 1, wherein:

19 the first actuator is adapted to move the component within a first range of  
20 frequencies; and

21 the second actuator is adapted to move the component within a second  
22 range of frequencies, the second range of frequencies being substantially higher  
23 than the first range of frequencies.

1           **10. (original)**   The hybrid actuator of Claim 9, wherein the first range  
2 of frequencies is less than or equal to approximately 25 cycles per second, and the  
3 second range of frequencies is greater than or equal to approximately 40 cycles per  
4 second.

5  
6           **11. (original)**   The hybrid actuator of Claim 1, wherein:  
7 the second actuator includes a clevis adapted to join a pushrod to the  
8 component.

9  
10          **12. (original)**   The hybrid actuator of Claim 1, wherein:  
11 the first actuator is activated at a frequency between 0 and 25 cycles per  
12 second.

13  
14          **13. (original)**   The hybrid actuator of Claim 1, wherein:  
15 the second actuator is activated at a frequency between 40 and 200 cycles  
16 per second.

1       **14. (withdrawn)**       A method for providing hybrid actuation,  
2 comprising:

3       providing a first actuator capable of providing a first actuation output  
4 movement;

5       providing a second actuator capable of providing a second actuation output  
6 movement;

7       combining the first actuation output movement with the second actuation  
8 output movement producing a hybrid actuation movement;

9       activating the first actuator; and

10       activating the second actuator.

11  
12       **15. (withdrawn)**       The method of Claim 14, wherein:  
13 providing the first actuator includes providing a hydraulic piston.

14  
15       **16. (withdrawn)**       The method of Claim 14, wherein:  
16 providing the second actuator includes providing a piezo-electric actuator.

17  
18       **17. (withdrawn)**       The method of Claim 16, wherein:  
19 the piezo-electric actuator includes an x-frame actuator.

20  
21       **18. (withdrawn)**       The method of Claim 16, wherein:  
22 the piezo-electric actuator includes a piezo-electric cylinder actuator.

1           **19. (withdrawn)**       The method of Claim 14, wherein:

2           combining the first actuation output movement with the second actuation  
3           output movement includes linking a pushrod between the first actuator and the  
4           second actuator.

5  
6           **20. (withdrawn)**       The method of Claim 14, wherein:

7           combining the first actuation output movement with the second actuation  
8           output movement includes mounting the first actuator to the second actuator.

9  
10          **21. (withdrawn)**       The method of Claim 14, wherein:

11          combining the first actuation output movement with the second actuation  
12          output movement includes at least one of adding the second actuation output  
13          movement to the first actuation output movement and subtracting the second  
14          actuation output movement from the first actuation output movement.

15  
16          **22. (withdrawn)**       The method of Claim 14, wherein:

17          activating the first actuator includes activating at a frequency between 0 and  
18          25 cycles per second.

19  
20          **23. (withdrawn)**       The method of Claim 14, wherein:

21          activating the second actuator includes activating at a frequency between 40  
22          and 200 cycles per second.

1           **24. (withdrawn)**           The method of Claim 14, wherein:

2           providing a first actuator includes providing a first actuator adapted to be  
3 driven within a first range of frequencies; and

4           providing a second actuator includes providing a second actuator adapted to  
5 be driven within a second range of frequencies, the second range of frequencies  
6 being substantially higher than the first range of frequencies.

7  
8           **25. (withdrawn)**           The method of Claim 24, wherein the first range  
9 of frequencies is less than or equal to approximately 25 cycles per second, and the  
10 second range of frequencies is greater than or equal to approximately 40 cycles per  
11 second.

1           **26. (previously presented)** A system for suppressing undesired  
2 movement of a component, comprising:

3           at least one motion sensor adapted to monitor the component;

4           a processor linked to the at least one motion sensor, the processor adapted  
5 to accept an input from the at least one motion sensor, and to control a plurality of  
6 actuators responsive to the input from the at least one motion sensor;

7           a first actuator controlled by the processor, the first actuator connected to  
8 the component, the first actuator adapted to move a first actuation distance at a  
9 first range of frequencies;

10           a second actuator controlled by the processor, the second actuator  
11 connected to the component, the second actuator adapted to move a second  
12 actuation distance at a second range of frequencies; and

13           a linkage connected to the first actuator and connected to the second  
14 actuator, the linkage adapted to combine the first actuation distance and the second  
15 actuation distance thereby moving the component a third actuation distance.

16  
17           **27. (original)** The system of Claim 26, wherein:  
18 the first actuator includes a hydraulic piston.

19  
20           **28. (original)** The system of Claim 26, wherein:  
21 the second actuator includes a piezo-electric actuator.

22  
23           **29. (withdrawn)** The system of Claim 28, wherein:  
24 the second actuator includes an x-frame actuator.  
25

1       **30. (original)**   The system of Claim 28, wherein:  
2       the second actuator includes a piezo-electric cylinder actuator.

3  
4       **31. (original)**   The system of Claim 26, wherein:  
5       the linkage includes a pushrod attached between the first actuator and the  
6       second actuator.

7  
8       **32. (original)**   The system of Claim 26, wherein:  
9       the linkage includes a mount attached to the second actuator adapted to  
10      hold the first actuator and move the first actuator the second actuation distance.

11  
12      **33. (original)**   The system of Claim 26, wherein:  
13      the third actuation distance includes at least one of adding the second  
14      actuation distance to the first actuation distance and subtracting the second  
15      actuation distance from the first actuation distance.

16  
17      **34. (previously presented)**   The system of Claim 26, wherein:  
18      the component includes at least one of an aircraft rudder, an aircraft  
19      stabilizer, and an aircraft control surface.

20  
21      **35. (original)**   The system of Claim 26, wherein:  
22      the first actuator is activated at a frequency between 0 and 25 cycles per  
23      second.  
24  
25



1           **36. (original)**   The system of Claim 26, wherein:  
2           the second actuator is activated at a frequency between 40 and 200 cycles  
3           per second.

4  
5           **37. (previously presented)**   The system of Claim 26, wherein the at  
6           least one motion sensor includes an accelerometer.

7  
8           **38. (original)**   The system of Claim 26, wherein the second range of  
9           frequencies is substantially higher than the first range of frequencies.

10  
11           **39. (withdrawn)**   A method for providing motion reduction,  
12           comprising:

13           sensing a motion and outputting an indication of motion;

14           processing the indication of motion and outputting a control response in  
15           opposition to the motion;

16           providing a first actuator adapted to receive the control response;

17           providing a second actuator adapted to receive the control response;

18           combining the first actuation movement with the second actuation  
19           movement producing a hybrid actuation movement in opposition to the motion;

20           activating the first actuator in opposition to the motion; and

21           activating the second actuator in opposition to the motion.

22  
23           **40. (withdrawn)**   The method of Claim 39, wherein:  
24           providing the first actuator includes providing a hydraulic piston.  
25

1       **41. (withdrawn)**       The method of Claim 39, wherein:  
2       providing the second actuator includes providing a piezo-electric actuator.

3  
4       **42. (withdrawn)**       The method of Claim 39, wherein:  
5       combining the first actuation movement with the second actuation  
6       movement includes linking a pushrod between the first actuator and the second  
7       actuator.

8  
9       **43. (withdrawn)**       The method of Claim 39, wherein:  
10       combining the first actuation movement with the second actuation  
11       movement includes mounting the first actuator to the second actuator.

12  
13       **44. (withdrawn)**       The method of Claim 39, wherein:  
14       combining the first actuation movement with the second actuation  
15       movement includes at least one of adding the second actuation movement to the  
16       first actuation movement and subtracting the second actuation movement from the  
17       first actuation movement.

18  
19       **45. (withdrawn)**       The method of Claim 39, wherein:  
20       activating the first actuator includes activating at a frequency between 0 and  
21       25 cycles per second.

1       **46. (withdrawn)**       The method of Claim 39, wherein:  
2       activating the second actuator includes activating at a frequency between 40  
3       and 200 cycles per second.

4  
5       **47. (withdrawn)**       The method of Claim 39, wherein:  
6       sensing a motion includes sensing a deflection of a component.

7  
8       **48. (withdrawn)**       The method of Claim 39, wherein:  
9       sensing a motion includes determining an acceleration.

10  
11       **49. (withdrawn)**       The method of Claim 39, further comprising:  
12       deflecting a control surface utilizing the hybrid actuation distance.

13  
14       **50. (withdrawn)**       The hybrid actuator of Claim 39, wherein:  
15       the motion includes at least one of vibration and buffeting of an aircraft  
16       component.

1           **51. (previously presented)** An aircraft with hybrid motion  
2 suppression, comprising:

3           a fuselage including an appendage;

4           at least one motion sensor adapted to sense motion of the appendage;

5           a processor linked to the at least one motion sensor, the processor adapted  
6 to accept an input from the at least one motion sensor, and to provide at least one  
7 output signal responsive to the input from the at least one motion sensor;

8           a first actuator controlled by the processor, the first actuator connected to  
9 the appendage, the first actuator adapted to receive the at least one output signal  
10 and to move a first actuation distance to oppose the undesired movement at a first  
11 range of frequencies;

12           a second actuator controlled by the processor, the second actuator  
13 connected to the appendage, the second actuator adapted to receive the at least one  
14 output signal and to move a second actuation distance to oppose the undesired  
15 movement at a second range of frequencies; and

16           a linkage connected to the first actuator and connected to the second  
17 actuator, the linkage adapted to combine the first actuation distance and the second  
18 actuation distance thereby moving at least a portion of the appendage a third  
19 actuation distance in opposition to the undesired movement.

20  
21           **52. (original)** The aircraft of Claim 51, wherein:

22           the first actuator includes a hydraulic piston.  
23  
24  
25

1       **53. (original)**   The aircraft of Claim 51, wherein:

2       the second actuator includes a piezo-electric actuator.

3  
4       **54. (original)**   The aircraft of Claim 51, wherein:

5       the linkage includes a pushrod attached between the first actuator and the  
6       second actuator.

7  
8       **55. (original)**   The aircraft of Claim 51, wherein:

9       the linkage includes a mount attached to the second actuator adapted to  
10      hold the first actuator and move the first actuator the second actuation distance.

11  
12      **56. (original)**   The aircraft of Claim 51, wherein:

13      the third actuation distance includes at least one of adding the second  
14      actuation distance to the first actuation distance and subtracting the second  
15      actuation distance from the first actuation distance.

16  
17      **57. (original)**   The aircraft of Claim 51, wherein:

18      the first actuator is activated at a frequency between 0 and 25 cycles per  
19      second.

20  
21      **58. (original)**   The aircraft of Claim 51, wherein:

22      the second actuator is activated at a frequency between 40 and 200 cycles  
23      per second.

1       **59. (previously presented)**   The aircraft of Claim 51, wherein:

2       the at least one motion sensor includes an accelerometer.

3  
4       **60. (original)**   The aircraft of Claim 51, wherein:

5       the portion of the appendage includes a control surface movably included in  
6       the appendage.